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**BFD IX-11 MATTRESS FIRE TEST**

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**Background**

In 1983 the Boston Fire Department instituted regulations for mattresses and box springs used in hotels and university dormitories. (1)\* For several years this regulation was enforced by reviewing material specifications and rendering judgements of compliance based on full scale test results of mattress constructions equivalent to those proposed for particular hotels or dormitories. In 1990 the mattress regulation was extended to the health care occupancy with notice that performance requirements would be based on a mattress fire test.(2) In November 1991 a procedure for conducting a fire test of mattress and bedding was published (3).

The test method described in this document is a variation of the procedure described in California Bureau of Home Furnishings Technical Bulletin 129 Flammability Test Procedure for Mattresses for Use in Public Buildings (4). The test method also provides for the evaluation of mattress and box spring assemblies in Underwriters Laboratory Standards UL 2060 (5).

**Scope**

This fire test procedure is designed to evaluate mattresses intended for use in health care facilities, hotels and dormitories. The Boston Fire Department Regulatory Action of October 25,1990 and subsequent revisions shall use this fire test method to prescribe performance requirements for mattresses, box springs, and bedding.

**Procedure**

The Boston Fire Department mattress fire test is a full scale test of a mattress assembly consisting of specified bedding and where applicable a box spring in a specified fire test room or open calorimeter. Flaming ignition of the bedding provides the only fuel for the fire test exposure.

**Fire Test Room and Instrumentation**

The fire test room is constructed in accordance with California Technical Bulletin No. 129 (4).

Alternate fire test rooms conforming to specifications set by ICBO and ASTM may be substituted for the fire test room cited above. A single door opening may be constructed as shown in Figure 1.

Instrumentation shall be provided to continuously measure and record carbon monoxide and oxygen; carbon dioxide may also be measured. Mass loss and the temperature four inches below the ceiling shall be continuously measured and recorded. Smoke obscuration shall be measured and recorded at the 4 ft. height level. Instrumentation should also

be provided to continuously calculate the rate of heat release and the total heat released in the test. The location of the gas sampling ports, the optical light path and the thermal probe shall essentially be as required by applicable provisions of CBHF TB 129 (4).

### **Furniture Calorimeter**

The furniture calorimeter shall be designed and assembled to accommodate a mattress and box spring with designated bedding. The furniture calorimeter shall provide the measurement capability described in UL 2060 (5). The source of ignition cited in the latter standards shall not be employed; the ignition of the bedding provides the source of ignitions.

### **Mattress and Bedding**

The product to be tested shall consist of a typical hotel single, institutional or dormitory size mattress with approximate dimensions of 31 in. by 77 in. For mattresses designed to be used with a box spring, the test assembly shall consist of the test mattress and the box spring constructed of the same materials and same size as used in the intended occupancy. The bedding employed for the test shall be as follows:

- **Sheets shall be 50/50 Cotton/Polyester percale**
- **Blanket shall be 50/50 Cotton/Polyester, thermal blanket**
- **Pillow filling shall be 100 percent polyester fiber**
- **Pillow case shall be 50/50 Cotton/Polyester percale.**

For health care facilities, a light weight disposable liquid impermeable pad can be added to the beddings.

The support for mattresses intended to be used without box springs shall be constructionally similar to that used in the proposed occupancy. For example, for health care facilities a solid support system shall be used. The mattress, bedding and box spring where used shall be conditioned for least 48 hours prior to test at 70 + 5 Deg. F. and a relative humidity of less than 55 per cent. Fire test shall commence within ten minutes of removal of mattress, bedding and box spring from the conditioning room.

### **Ignition, Data, Acquisition and Test**

The mattress, bedding and box spring where applicable shall be assembled in a suitable support system in the test room as shown in Figure 1 or in an open calorimeter. Bedding shall be prepared as shown in Figure 2 with the top sheet and blanket partially rolled back and hanging to the side of the mattress. The bedding is ignited by contact with an open flame of 2 to 4 in. in length at time zero. The progress of the test is recorded on a video tape. The data specified in this procedure are recorded. In addition, the progress of the test is observed to ascertain and record significant events such as sudden increase in flame height, visible smoke production and the onset of molten flaming droplets typically produced by burning polyurethane and thermo plastic fibers. The test is continued for 30 minutes unless conditions known to signal the onset of room flash over develop.

### **Test Report**

A report shall be prepared and submitted along with the test video to the Boston Fire Department for evaluation. The report shall identify the laboratory and include a brief description of the mattress, bedding and support system. The following quantities shall be measured and recorded at **6 second intervals**:

- **Ceiling temperature increase, deg. F.(or deg.C.)**
- **Mass loss, kilograms (or pounds)**
- **Carbon monoxide, ppm in room**
- **Rate of heat release, kilowatts**
- **Light obscuration, percentage, at 4 ft. height in room**

The following test data for the evaluation conducted with a furniture calorimeter shall be measured and tabulated at **6 sec. intervals**:

- **Rate of heat release, kilowatts**
- **Mass loss, kilograms**
- **Carbon monoxide, grams**

The rate of heat release data shall be plotted vs. time in seconds and the integrated heat released in the first 5 minutes, and the first ten minutes and the entire test shall be reported in megajoules. A brief description of significant test observable as described in this procedure shall be included in the test report.

### **Performance Criteria**

Performance criteria are provided in the Boston Fire Department Regulatory Action of November 12,1991.

### **References**

1. Boston Fire Department Policy Statement Regulation of Mattresses in Hotels and Dormitories, September 20,1989.
2. Boston Fire Department, Regulation of Mattresses, Portable Mattresses and Mattress Pads, October 25,1990.
3. Boston Fire Department, BFD IX-11 (1991), Mattress Fire Test.
4. California Bureau of Home Furnishings, Technical Bulletin 129, Flammability Test Procedure for Mattresses for Use in Public Buildings (1992).
5. Underwriters Laboratories, UL 2060, Standard for Fire Test of Mattresses with Bed Clothing (1993).

